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DATE: **November 5, 2008**
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Re: RESPONSE TO NOTIFICATION OF NON-COMPLIANT APPEAL BRIEF (37 CFR 41.37)FILED ON OCTOBER 14, 2008

Case No: Zarrabizadeh 24

Serial No: 10/673,893

File Date: September 29, 2003

Title: Color Selection Scheme For Digital Video Watermarking

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MICHELE M. RUTTER

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IN THE UNITED STATES
PATENT AND TRADEMARK OFFICE

PATENT APPLICATION

Inventor(s): **Mohammad Hossein Zarrabizadeh**

Case: **24**

Serial No.: **10/673,893** Group Art Unit: 2624

Filing Date: **September 29, 2003**

Examiner: **Seyed H. Azarian**

Title: **Color Selection Scheme For Digital Video Watermarking**

COMMISSIONER FOR PATENTS
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SIR:

Enclosed is a Corrected Appeal Brief filed in response to a Notification of Non-Compliant Appeal Brief (37 C.F.R. 41.37) dated October 31, 2008. A Notice of Appeal was timely filed.

There is no additional fee.

In the event of non-payment or improper payment of a required fee, the Commissioner is authorized to charge or to credit **Deposit Account No. 12-2325** as required to correct the error.

Respectfully,

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November 5, 2008
Date

MICHELE M. RUTTER

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Patent Application

Inventor(s):	M. H. Zarrabizadeh		
Case:	24		
Serial No.:	10/673,893	**Group Art Unit:**	2624
Filed:	December 11, 2000		
Examiner:	S. H. Azarian		
Title:	Color Selection Scheme For Digital Video Watermarking		

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ALEXANDRIA, VA 22313-1450

SIR:

Appellant's Brief Under 37 C.F.R. 41.37

This is an appeal to the Board of Patent Appeals and Interferences from the Final Rejection dated November 14, 2007. This brief is a corrected brief filed in response to a Notification of Non-Compliant Appeal Brief (37 C.F.R 41.37) dated October 31, 2008.

A Notice of Appeal was timely filed.

Real Party in Interest

The real party in interest is Lucent Technologies Inc.

Related Appeals and Interferences

There are no related appeals or interferences.

Status of Claims

Claims 1-34 are pending in the application. As indicated in the Advisory Action dated May 29, 2008, claims 26, 27, and 31-34 stand allowed. Claims 6, 15, 19, and 23 are objected to but are indicated to contain allowable subject matter. Claims 1-5, 7-14, 16-17, 20-22, 24-25, and 28-30 stand finally rejected.

The rejection of claims 1-5, 7-14, 16-17, 20-22, 24-25, and 28-30, and objection to claims 6, 15, 19, and 23, is hereby appealed. A copy of the claims under appeal as now presented are appended to this brief in Appendix A.

Status of Amendments

Applicants' amendments after the first Office Action were entered.

Applicants filed various minor amendments after Final Rejection on May 9, 2008 in an attempt to secure allowance. In particular, independent claims 1, 20, 26, 28, 30, 31, and 33 were amended to indicated that the step of selecting that was recited therein was performed automatically. In this regard, applicant notes that **no** reference was employed in a rejection that allegedly taught that the selecting step was performed manually. Rather, the alleged selecting step in the cited references was performed in an automated way. These claims were also to indicate that the table referred to therein was stored in a computer readable medium. Again, **no** reference was employed in a rejection having a table stored in any other type of medium.

Therefore, it seems that a new search would **not** have been required, and the amendments should have been entered. In particular, applicants believe the proposed amendments did not raise any new issue requiring further search and/or consideration since the amendments amplify issues previously discussed throughout prosecution

However, in Advisory Office Action, it was indicated that these amendments were not entered. In particular, the Advisory Office Action stated that the amended claims and presented arguments require further study. However, applicant notes that the amended language was **not** relied upon in any way for novelty or to avoid prior art with respect to the proposed-amended claims, **nor** did it address any actual rejection set forth by the Office Action. Rather, as specified in applicant's Amendment after Final Rejection on May 9, 2008, the independent method claims were amended so that the language more clearly represents the intention that the step recited therein is performed automatically, i.e., it is not a human mental step, and that the table employed is in a computer readable medium. There was **no** intention to change the scope of the invention. Indeed, it was noted that for a video signal, which is called for in the amended claims, it would be impossible in practical usage for a human to perform the recited step of the independent

method claims in a timely manner to actually implement the invention. Furthermore, these limitations were already required by, if not explicitly set forth in, the apparatus claims. For example, claim 21 already recited "a perception-based table in a computer readable medium", and of course, being an apparatus, it would perform the selecting automatically. Likewise, claim 22 recited "computer readable store containing a perception-based table that is independent of said image", and again, being an apparatus, it would perform automatically.

Thus, it is believed that inserting the word "automatically" merely made explicit what was already implicit in the claims. Likewise, the amendment specifying that the table referred to in the claims was stored in a computer readable medium was also already inherently in the claims, for the same reason.

Thus, **no** new search was actually required for these minor amendments. It was thus improper to not enter them.

Failure to enter the amendments appears to applicant to raise some confusion as to exactly what is the language of claims 26 and 31-34 which were indicated to be allowable. Presumably they are allowable without the additional language. The question then is, if they were already allowable without the additional language, why was the amendment for these claims not entered?

Summary of the Claimed Subject Matter

Watermarking of video signals is, generally, the inclusion within the video itself of additional information. This can be useful to provide an embedded identification of the source of a video, to keep track of where and for how long a video is played, and to communicate information via the video to an ancillary device. Prior art techniques for watermarking video signals typically encoded the additional information in an analog format within the video itself using the luminance of the video to carry the additional information. However, the human visual system is very sensitive to the luminance signal, and so a person viewing a watermarked signal easily perceives distortion which is caused by the changes made to the video signal to convey the additional information when there is an attempt to increase the bit rate of the additional information beyond a certain point, e.g., beyond 120 bits per second. Thus, although the prior art's techniques of watermarking of video signals has had some success in certain applications, such success has been limited by the extremely small bit rate that is achievable without perceivable distortion by a person viewing the video signal carrying the additional information.

In previously filed United States Patent Application Serial No. 10/342704, I, along with my coinventor thereon, recognized that the human visual system is much less

sensitive to chrominance than to luminance. Therefore, we developed a system for digital watermarking a video signal that, in accordance with the principles of the invention, inserts the additional information of the watermarking signal on the chrominance component of the video signal rather than on its luminance signal. Thus, the additional information is "impressed" upon the chrominance component of the video signal. Advantageously, although there may be significant distortion on the chrominance signal, especially when the additional information has higher bit rates than is achievable without perceivable distortion by the prior art, nevertheless such distortion will not be detected by the human visual system, provided it is appropriately managed. Thus, the additional information can have a higher bit rate as compared with that achievable by the prior art, e.g., bit rates greater than 150 bits per second can be achieved. Further advantageously, the additional data can be recovered from the video signal even after the video signal watermarked with the additional data is compressed using the Motion Picture Expert Group (MPEG)-1 and MPEG-2 encoding systems.

The particular chrominance portion selected to carry the watermarking for any pixel is selected in United States Patent Application Serial No. 10/342704 by a color selection unit. The color selection unit determines the selected chrominance component as a function of the RGB and the YUV representations of the pixel using a prescribed formula. Since digital video is often transmitted only in YUV format, to use the system of United States Patent Application Serial No. 10/342704 with such YUV formatted video, it is necessary to develop therefrom the corresponding RGB formatted video. Disadvantageously, to do so requires considerable processing power. Furthermore, although it is very good, it was later discovered that the mathematical model underlying the formula employed in the selection process of United States Patent Application Serial No. 10/3427 does not necessarily always produce flicker-free results.

In accordance with the principles of the instant invention, the process of determining the chrominance portion to be watermarked may be improved by employing during the process a perception-based table that indicates for various pixels which of the chrominance portions, if any, should be selected for watermarking. In accordance with an aspect of the invention, only values for Y, U, and V of a pixel may be required to access the table and determine which chrominance portion should be selected. Advantageously, when the digital video is in YUV format, the use of R, G, and B is not required to select the chrominance portion, thereby reducing significantly the necessary processing power. In accordance with another aspect of the invention, the table may be represented such that it may be accessed using only R, G, and B values, so that there is no need to convert a source video in RGB format to YUV format in order to perform color selection.

In one embodiment of the invention, the table is accessed by supplying Y, U, and V values, which may be decimated and/or quantized, and retrieving from the table an indication of whether U or V should be selected. In accordance with yet another aspect of the invention, the table may be modified so that it may indicate which of U or V should be selected, or that neither should be selected, e.g., when the color of the pixel is dark blue and/or dark purple, indicating that this pixel should not be watermarked at all.

In accordance with another aspect of the invention, a mixed-mode of processing may be employed using the table and some processing. Advantageously, the table may be simplified, e.g., reduced by half its size, because a large section of the table may be replaced by a simple test on the pixel values, e.g., U<128, to determine the selected chrominance portion.

Advantageously, the table may be changed on the fly without changing the underlying process, e.g., computer code, employed in the selection process.

Independent claim 1 relates to a method for watermarking a video signal which includes the step of selecting a chrominance portion of a pixel of an image of a video signal to be watermarked, the video signal to be watermarked without changing its luminance, the selecting step employing a perception-based table that is independent of the image and indicates for each of at least a plurality of possible pixels in a colorspace which, if any, of the chrominance portions of the plurality of pixels in the colorspace should be selected for watermarking. Corresponding support in the specification is found at least at page 2, line 18 to page 3, line 7; page 4, line 5 to page 12, line 21; page 27, line 13 to page 45, line 31, and associated FIGs. 1, 6, 7, 8, and 9. Note that Table 1 represents the contents of such an exemplary table.

Independent claim 17 relates to an apparatus for supplying an indication as to which chrominance portion of a pixel an image of a video signal, if any, is better suited to be altered so as to carry additional watermark information without changing the pixel's luminance, the apparatus including a perception-based table in a computer readable media for at least a portion of the possible pixel colorspace, the table being independent of the image, the table specifying for pixels that are within the portion of the colorspace the chrominance portion to be indicated by the apparatus. Corresponding support in the specification is found at least at page 2, line 18 to page 3, line 7; page 4, line 5 to page 12, line 21; page 27, line 13 to page 45, line 31, and associated FIGs. 1, 6, 7, 8, and 9. Note that Table 1 represents the contents of such an exemplary table.

Independent claim 20 relates to a method for detecting a watermark signal including the step of selecting a chrominance portion of a pixel of an image of a video signal, the video signal having been watermarked without changing its luminance, the

selecting step employing a perception-based table that is independent of the image and which indicates for each of at least a plurality of possible pixels in a colorspace which, if any, of the chrominance portions most likely had watermark data added thereto. Corresponding support in the specification is found at least at page 2, line 18 to page 3, line 7; page 4, line 5 to page 5, line 20; page 12, line 22 to page 14, line 9; page 27, line 13 to page 45, line 1, and associated FIGs. 2, 6, 7, 8, and 10.

Claim 21 relates to an apparatus for selecting a chrominance portion of a pixel of an image of a video signal to be watermarked, the apparatus comprising a perception-based table in a computer readable medium that indicates for each of at least a plurality of possible pixels in at least a portion of a colorspace which, if any, of the chrominance portions would be least likely to introduce a visible artifact should watermark data be added thereto, the video signal to be watermarked without changing its luminance. Corresponding support in the specification is found at least at page 2, line 18 to page 3, line 7; page 4, line 5 to page 12, line 21; page 27, line 13 to page 45, line 31, and associated FIGs. 1, 6, 7, 8, and 9. Note that Table 1 represents the contents of such an exemplary table.

Claim 22 relates to an apparatus for selecting a chrominance portion of a pixel of an image of a video signal to be watermarked so that there are effectively no changes to a luminance of the video signal, including a computer readable store containing a perception-based table that is independent of the image and which indicates for each of at least a plurality of possible pixels in at least a portion of a colorspace which, if any, of the chrominance portions should be selected for watermarking; and means for accessing the store to determine which chrominance portion, if any, to select, when the pixel of the image to be watermarked is one of the pixels in the portion of the colorspace. Corresponding support in the specification is found at least at page 2, line 18 to page 3, line 7; page 4, line 5 to page 12, line 21; page 27, line 13 to page 45, line 31, and associated FIGs. 1, 6, 7, 8, and 9. Note that Table 1 represents the contents of such an exemplary table. The means for accessing is supported more specifically by page 2, line 21 to page 3, line 5; page 4, line 5 to page 5, line 17; color selection 105 of FIGs. 1 and 9 along with the associated description in the specification, e.g., page 6, line 1 to page 7, line 13; FIG. 6, steps 601, 603, 605, 607, and 609 along with the associated description in the specification, e.g., page 27, line 13 to page 42, line 5; and FIG. 8, steps 803, 805, 807, and 809 along with the associated description in the specification, e.g., page 42, line 13 to page 44, line 25.

Claim 24 relates to an apparatus for selecting a chrominance portion of a pixel of an image of a video signal, the video signal having been watermarked without changing

its luminance, including a computer readable store containing a perception-based table that is independent of the image and which indicates for each of at least a plurality of possible pixels in at least a portion of a colorspace which, if any, of the chrominance portions most likely had watermarking data added thereto; and means for accessing the store to determine which chrominance portion, if any, to select, when the pixel is one of the pixels in the portion of the colorspace. Corresponding support in the specification is found at least at page 2, line 18 to page 3, line 7; page 4, line 5 to page 5, line 20; page 12, line 22 to page 14, line 9; page 27, line 13 to page 45, line 1, and associated FIGs. 2, 6, 7, 8, and 10. The means for accessing is supported more specifically by page 2, line 21 to page 3, line 5; page 4, line 5 to page 5, line 17; color selection 207 of FIGs. 2 and 10 along with the associated description in the specification, e.g., page 13, lines 9 to 29; FIG. 6, steps 601, 603, 605, 607, and 609 along with the associated description in the specification, e.g., page 27, line 13 to page 42, line 5; and FIG. 8, steps 802, 803, 805, 807, and 809 along with the associated description in the specification, e.g., page 43, line 25 to page 44, line 25.

Claim 25 relates to an apparatus in a receiver for selecting a chrominance portion of a pixel of an image of a video signal that may have been watermarked in a transmitter, the video signal have been watermarked so as not to change its luminance, including a computer readable store containing a perception-based table that is independent of the image and which indicates for each of at least a plurality of possible pixels in at least a portion of a colorspace which, if any, of the chrominance portions was most likely selected to be watermark; and means for accessing the store to determine which chrominance portion, if any, to select, when the pixel of the image is within the portion of the colorspace. Corresponding support in the specification is found at least at page 2, line 18 to page 3, line 7; page 4, line 5 to page 5, line 20; page 12, line 22 to page 14, line 9; page 27, line 13 to page 45, line 1, and associated FIGs. 2, 6, 7, 8, and 10. The means for accessing is supported more specifically by page 2, line 21 to page 3, line 5; page 4, line 5 to page 5, line 17; color selection 207 of FIGs. 2 and 10 along with the associated description in the specification, e.g., page 13, lines 9 to 29; FIG. 6, steps 601, 603, 605, 607, and 609 along with the associated description in the specification, e.g., page 27, line 13 to page 42, line 5; and FIG. 8, steps 802, 803, 805, 807, and 809 along with the associated description in the specification, e.g., page 43, line 25 to page 44, line 25.

Claim 26 relates to a method of selecting at most one chrominance portion of a pixel of an image of a video signal to be watermarked by adding thereto additional information, the selecting step employing a perception-based table that is independent of (i) the image and (ii) the additional information, the table indicating for each of at least a

plurality of possible pixels in a colorspace which one, if any, of the chrominance portions of the plurality of pixels in the colorspace should be selected to have the additional information added thereto. Corresponding support in the specification is found at least at page 2, line 18 to page 3, line 7; page 4, line 5 to page 12, line 21; page 27, line 13 to page 45, line 31, and associated FIGs. 1, 6, 7, 8, and 9. Note that Table 1 represents the contents of such an exemplary table.

Claim 27 relates to an apparatus for supplying an indication as to which chrominance portion of a pixel an image of a video signal, if any, is better suited to be altered so as to carry additional watermark information, the apparatus comprising a perception-based table in a computer readable media for at least a portion of the possible pixel colorspace, the table being independent of (i) the image and (ii) the additional watermark information, the table specifying for pixels that are within the portion of the colorspace the chrominance portion to be indicated by the apparatus. Corresponding support in the specification is found at least at page 2, line 18 to page 3, line 7; page 4, line 5 to page 12, line 21; page 27, line 13 to page 45, line 31, and associated FIGs. 1, 6, 7, 8, and 9. Note that Table 1 represents the contents of such an exemplary table.

Claim 28 relates to a detecting a watermark signal by selecting a chrominance portion of a pixel of an image of a video signal, the video signal having been watermarked with watermark information, the selecting step employing a perception-based table that is independent of (i) the image and (ii) the watermark information and which indicates for each of at least a plurality of possible pixels in a colorspace which, if any, of the chrominance portions most likely had watermark data added thereto. Corresponding support in the specification is found at least at page 2, line 18 to page 3, line 7; page 4, line 5 to page 5, line 20; page 12, line 22 to page 14, line 9; page 27, line 13 to page 45, line 1, and associated FIGs. 2, 6, 7, 8, and 10.

Claim 29 relates to an apparatus for selecting a chrominance portion of a pixel of an image of a video signal to be watermarked by adding thereto additional information, the apparatus comprising a perception-based table in a computer readable medium that is independent of (i) the image and (ii) the additional information and which indicates for each of at least a plurality of possible pixels in at least a portion of a colorspace which, if any, of the chrominance portions would be least likely to introduce a visible artifact should watermark data be added thereto. Corresponding support in the specification is found at least at page 2, line 18 to page 3, line 7; page 4, line 5 to page 12, line 21; page 27, line 13 to page 45, line 31, and associated FIGs. 1, 6, 7, 8, and 9. Note that Table 1 represents the contents of such an exemplary table.

Claim 30 relates to a method for detecting a watermark signal including the step of selecting a chrominance portion of a pixel of an image of a video signal that had watermark data added thereto, the selecting step employing a perception-based table that is independent of (i) the image and (ii) the watermark data and which indicates for each of at least a plurality of possible pixels in a colorspace which, if any, of the chrominance portions most likely had watermark data added thereto. Corresponding support in the specification is found at least at page 2, line 18 to page 3, line 7; page 4, line 5 to page 5, line 20; page 12, line 22 to page 14, line 9; page 27, line 13 to page 45, line 1, and associated FIGs. 2, 6, 7, 8, and 10.

Claim 31 relates to a method for selecting no more than one chrominance portion of a pixel of an image of a video signal to be watermarked, the selecting employing a perception-based table that is independent of the image and indicates for each of at least a plurality of possible pixels in a colorspace which, if any, of the chrominance portions of the plurality of pixels in the colorspace should be selected for watermarking. Corresponding support in the specification is found at least at page 2, line 18 to page 3, line 7; page 4, line 5 to page 12, line 21; page 27, line 13 to page 45, line 31, and associated FIGs. 1, 6, 7, 8, and 9. Note that Table 1 represents the contents of such an exemplary table.

Claim 32 relates to an apparatus for supplying an indication as to only one of which, if any, chrominance portion of a pixel an image of a video signal, is better suited to be altered so as to carry additional watermark information, the apparatus comprising a perception-based table in a computer readable media for at least a portion of the possible pixel colorspace, the table being independent of the image, the table specifying for pixels that are within the portion of the colorspace the particular no more than one chrominance portion to be indicated by the apparatus. Corresponding support in the specification is found at least at page 2, line 18 to page 3, line 7; page 4, line 5 to page 12, line 21; page 27, line 13 to page 45, line 31, and associated FIGs. 1, 6, 7, 8, and 9. Note that Table 1 represents the contents of such an exemplary table.

Claim 33 relates to a method for detecting a watermark signal by selecting no more than one of a chrominance portion of a pixel of an image of a video signal, the video signal having been watermarked, the selecting step employing a perception-based table that is independent of the image and which indicates for each of at least a plurality of possible pixels in a colorspace which, if any, of the chrominance portions most likely had watermark data added thereto. Corresponding support in the specification is found at least at page 2, line 18 to page 3, line 7; page 4, line 5 to page 5, line 20; page 12, line 22

to page 14, line 9; page 27, line 13 to page 45, line 1, and associated FIGs. 2, 6, 7, 8, and 10.

Claim 34 relates to an apparatus for selecting no more than one chrominance portion of a pixel of an image of a video signal to be watermarked, the apparatus comprising a perception-based table in a computer readable medium that indicates for each of at least a plurality of possible pixels in at least a portion of a colorspace which, if any, of the chrominance portions would be least likely to introduce a visible artifact should watermark data be added thereto. Corresponding support in the specification is found at least at page 2, line 18 to page 3, line 7; page 4, line 5 to page 12, line 21; page 27, line 13 to page 45, line 31, and associated FIGs. 1, 6, 7, 8, and 9. Note that Table 1 represents the contents of such an exemplary table.

Grounds of Rejection to be Reviewed on Appeal

I. Are claims 1-5, 7-14, 16-17, 20-22, 24-25, and 28-30 properly rejected under 35 U.S.C. 103(a) as being anticipated by United States Patent No. 6,590,996 issued to Reed et al. on July 8, 2003 in view of United States Patent No. 7,072,487 issued to Reed et al. on July 4, 2006.

Argument

Issue I – Rejection of Claims 1-5, 7-14, 16-17, 20-22, 24-25, and 28-30 Under 35 U.S.C. 103(a)

Claims 1-5, 7-14, 16-17, 20-22, 24-25, and 28-30 are rejected under 35 U.S.C. 103(a) as being anticipated by United States Patent No. 6,590,996 issued to Reed et al. on July 8, 2003 in view of United States Patent No. 7,072,487 issued to Reed et al. on July 4, 2006.

This ground of rejection is respectfully traversed for the following reasons.

First, neither Reed '996 nor Reed '487 teaches to **not** modify the luminance, as required by applicant's claims. Rather, both Reed '996 and Reed '487 each teaches the permissibility, if not the necessity, to modify the luminance.

As applied to video signals, luminance represents the brightness in an image i.e., the "black and white" or achromatic portion of the image. Thus, luminance represents the image without any color. For color systems, luminance is typically paired with chrominance, which represent the color information.

Generally, Reed '996 discusses mapping a desired specified change to an image attribute which will indicate watermark data, the change being straightforwardly implementable by a change to the color components (apparently also referred to therein as color values and color channels), to a different change, which will likewise indicate the same watermark data but be less visible to a viewer. (See Reed '996, column 1, lines 29-33 and column 34, lines 10-17.)

For example, according to one arrangement of Reed '996, a desired change in luminance that represents the watermark data is achieved by implementing a change to the colors of the image that has the same **effect on the luminance**, but would be less visible to a viewer. (See column 1, lines 39-59, column 34, lines 10-24, and column 35,

lines 8-17 and 54-62.) Thus, Reed '996 permits, and indeed teaches to make, changes to the luminance of the signal. (See also, column 37, lines 28-61.)

Alternatively, according to another arrangement of Reed '996, a specified desired change in chrominance is mapped to changes in the color values of the image sample in an attempt to reduce the visibility of a change ultimately implemented. More specifically, Reed '996 teaches to actually change the color values that are used to represent a pixel. Note that these color values—for example red, blue, green, referred to as R, G, B; or cyan, magenta, yellow, referred to as C, M, Y—are **not** distinct from luminance and are **not** the same as what is commonly referred to as chrominance, which are the U and V elements of the Y, U, V representation, where Y is luminance. (See Reed '996, column 37, lines 14-18.) As a result, changing the color channels as is done in Reed '996 can result in changes to the luminance. (See Reed '996, column 36, lines 1 – column 37, line 62.)

Thus, Reed '996 teaches at least the permissibility of modifying the luminance, and so it does **not** teach to not modify the luminance. Indeed, Reed '996, by permitting changes to the luminance, appears to suffer from the problem enumerated by applicant in the background section of the instant application, namely, only being able to achieve only a rather limited bandwidth for the watermark signal due to the higher likelihood of a user perceiving changes in luminance. Consequently, Reed '996 teaches away from applicant's invention in this regard.

By contrast, applicant's independent claims require that the watermarking process that is being performed does **not** change the luminance of the video signal being watermarked. Indeed, in the exemplary embodiments of the instant application, applicant achieves this by having the chrominance (U and V) each be represented separate from the luminance (Y) and only modifying the chrominance, i.e., the U and V as appropriate, but **never** the Y.

Turning to Reed '487, Reed '487 is a watermark detection technique that relies on the watermarking procedure having modified the luminance of the original signal. See, for example, Reed '487, figures 2 and 4 as well as column 1, lines 22-28, column 2, lines 30-43 and 54-58, which explains that the "scale to black" watermarking technique

modifies the luminance, and that the Reed '487 is directed to better extracting the watermark signal from images that were watermarked by modifying their luminance using scale to black watermarking. Thus, clearly, Reed '487 teaches the appropriateness of modifying the luminance, rather than that the luminance should **not** be modified.

The projection and luminance axis mentioned by the Office Action has nothing to do with the application of the watermark and the modifying of the luminance during the watermark process, but rather is employed as part of the detection process. However, by that point the image was already watermarked using the scale to black technique, and thus has already had its luminance modified. Therefore, Reed '487 teaches to modify the luminance rather than to **not** modify the luminance.

Thus, a combination of Reed '996 and Reed '487 would **not** teach applicant's claim limitation to **not** to modify the luminance, since at a minimum they each teach that it permissible to modify the luminance, and teach various methods how to do so and to detect such changes.

Another point of note is that neither Reed '996 nor Reed '487 teaches a table as recited in independent applicant's claims. More specifically, the table of Reed '996 does **not** indicate which, if any, of the chrominance portions of a plurality of pixels in a colorspace should be selected for watermarking, as required by applicant's claims. This is because, in Reed '996 the table is employed for a very different purpose, namely, for performing mapping or scaling. See Reed '996, column 1, lines 46-65. Since the table of Reed '996 is **not** used for the purpose of determining, i.e., indicating which, if any, of the chrominance portions of a plurality of pixels in a colorspace should be selected for watermarking, as required by applicant's claims, the table of Reed '996 need **not**, and indeed does **not**, contain information suitable for indicating which, if any, of the chrominance portions of a plurality of pixels in a colorspace should be selected for watermarking.

Reed '487 does **not** teach a table at all. Therefore, Reed '487 cannot teach a table that is used for the purpose of indicating which, if any, of the chrominance portions of a plurality of pixels in a colorspace should be selected for watermarking, as required by applicant's claims.

Since neither Reed' 996 nor Reed '487 teaches a table that indicates which, if any, of the chrominance portions of a plurality of pixels in a colorspace should be, or was, selected for watermarking, as required by applicant's claims, a combination of these references cannot teach such a table either.

Applicant's independent claims also require that the table recited by applicant's claims is independent of the content of the image to be watermarked. In other words, the values in the table do not depend upon the content of the image being watermarked in any way. For example, applicant's Table 1 is one such table, and its values are fixed and given in Table 1. Clearly then, Table 1, which would be used for all images of the video signal, does not depend on the particular image being watermarked, since it was created without knowing the content of any image that it would be used to watermark.

Such a table may then be used to determine the chrominance portion to be selected, or was selected, for watermarking of any pixel within the colorspace of the table, regardless of any information about the image from which that pixel comes. All that is required is the pixel's YUV values.

By contrast, Reed '996, in column 11, lines 16-33, makes it clear that in at least some arrangements taught therein the portions of the image that are identified are based on the content of the image being watermarked. This is because the cited section of Reed '996 teaches that a perceptual analysis of the input image itself is performed to identify portions of the image that can withstand more watermark signal content.

In yet another arrangement of Reed '996, a transform domain is employed. However, in such transform domain, actual pixels are not present. This is because, in the transform domain the characteristics of blocks of pixels are represented together, but the individual pixels do not exist in the transform domain. Thus, in the transform domain, decisions cannot be made on an individual pixel level, as required by applicant's independent claims.

Note that the claim recitation of "without changing its luminance" is well-supported in the specification as filed. This is because, by definition, when one changes only the U or the V in a YUV system, the luminance is not changed, because the Y is the luminance and it remains unchanged. The teaching of applicant's specification is to only

change a chrominance portion, i.e., the value of U or the value of V, and **not** the value of the luminance, i.e., Y. Since nowhere in his teaching of the instant invention does applicant teach to change the Y value, the teaching of the specification supports the claim language that the luminance is **not** changed

Furthermore, the section of the specification regarding step 305 does **not** teach to modify the Y value of any pixel. Indeed, computing the variance of the luminance is **not** the same as changing the value of the luminance for any pixel. Rather, the value of the luminance variance computed for the pixel, var(p,q), is used later on in the calculations used in modifying the values of one of the U or the V, given the prescribed thresholds. (See for example, page 16, line 18 through page 18, line 31 of applicant's specification as filed.) However, the value of Y of any pixel, i.e., the value of the pixel's luminance, is **never** modified. Only the values of U and V are modified, and these are clearly **not** luminance values.

Thus, applicant's claim language is support by the specification as originally filed.

Conclusion

In view of the foregoing, it is submitted that the Examiner is in error. It is, accordingly, respectfully requested that the rejection of claims 1-5, 7-14, 16-17, 20-22, 24-25, and 28-30 be reversed and the application passed to issue. It is also requested that applicant's unentered amendments be entered. Should it be necessary, permission for an Examiner's amendment to this effect is hereby granted.

Respectfully,

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Claims Appendix

Claims

1. A method comprising the step of:

selecting a chrominance portion of a pixel of an image of a video signal to be watermarked, said video signal to be watermarked without changing its luminance, said selecting step employing a perception-based table that is independent of said image and indicates for each of at least a plurality of possible pixels in a colorspace which, if any, of the chrominance portions of said plurality of pixels in said colorspace should be selected for watermarking.

2. The invention as defined in claim 1 wherein said perception-based table indicates for each entry therein whether to watermark only a first chrominance portion or only a second chrominance portion.

3. The invention as defined in claim 1 wherein said perception-based table indicates for each entry therein whether to watermark a first chrominance portion, a second chrominance portion, or not to watermark at all.

4. The invention as defined in claim 1 wherein said perception-based table is in computer readable form.

5. The invention as defined in claim 1 wherein said perception-based table divides an entire colorspace into regions, at least one of said possible pixels within each said region, and said perception-based table supplies an indication for said pixel based on which region of said perception-based table said pixel falls.

6. The invention as defined in claim 1 wherein said pixel of said image is part of a digital video bitstream represented in YUV format and wherein said perception-based table indicates for any pixel that could possibly be in said image to watermark U or V as a function of the Y, U, and V values of said pixel.

7. The invention as defined in claim 1 wherein said pixel of said image is part of a digital video bitstream represented in YUV format, and wherein said selecting step is performed using only said YUV formatted digital bitstream directly and no other version of said digital bitstream formatted in any other format.

8. The invention as defined in claim 1 wherein said pixel of said image is part of a digital video bitstream represented using a first colorspace type representation, and wherein, said selecting step is performed using only a digital bitstream formatted in said first colorspace type representation directly and other colorspace type representation.

9. The invention as defined in claim 1 wherein said pixel of said image is a decimated pixel derived from an original digital video bitstream.

10. The invention as defined in claim 1 wherein said pixel of said image is a decimated pixel derived from an original digital video bitstream represented in YUV format.

11. The invention as defined in claim 1 wherein said pixel of said image is a quantized pixel derived from an original digital video bitstream.

12. The invention as defined in claim 1 wherein said pixel of said image is a quantized pixel derived from an original digital video bitstream represented in YUV format.

13. The invention as defined in claim 1 wherein said perception-based table contains information to indicate which, if any, of the chrominance portions should be selected for watermarking for every possible pixel value of the entirety of said colorspace.

14. The invention as defined in claim 1 wherein said perception-based table contains information to indicate which, if any, of the chrominance portions should be selected for watermarking for each possible pixel of only a prescribed portion of said colorspace, and wherein said selecting step further comprises the step of determining that pixel of said image is within said prescribed portion of said colorspace for which said perception-based table contains information.

15. The invention as defined in claim 1 wherein said perception-based table contains information to indicate which, if any, of the chrominance portions should be selected for watermarking for each possible pixel of only a portion of said colorspace, and wherein said method further comprises the steps of:

determining that pixel of said image is not within said portion of said colorspace for which said perception-based table contains information; and

determining which, if any, of the chrominance portions should be selected for watermarking for said pixel of said image, as a computed function of at least one value of said pixel.

16. The invention as defined in claim 1 wherein a chrominance portion of said pixel of said image is watermarked by having its value changed to represent the conveyance of additional data other than the original value of said chrominance portion.

17. Apparatus for supplying an indication as to which chrominance portion of a pixel an image of a video signal, if any, is better suited to be altered so as to carry additional watermark information without changing said pixel's luminance, said apparatus comprising a perception-based table in a computer readable media for at least a portion of the possible pixel colorspace, said table being independent of said image, said table specifying for pixels that are within said portion of said colorspace the chrominance portion to be indicated by said apparatus.

18. The invention as defined in claim 17 further comprising a computation unit for indicating for a pixel of said image that is not within said portion of said colorspace which chrominance portion is to be indicated based on at least a value of one of said chrominance portions of said pixel of said image.

19. The invention as defined in claim 17 wherein said chrominance portion is better suited to be altered when altering said chrominance portion will produce less, if any, visible artifact than altering any other chrominance portion of said pixel of said image.

20. A method for detecting a watermark signal comprising the step of:

selecting a chrominance portion of a pixel of an image of a video signal, said video signal having been watermarked without changing its luminance, said selecting step employing a perception-based table that is independent of said image and which indicates for each of at least a plurality of possible pixels in a colorspace which, if any, of the chrominance portions most likely had watermark data added thereto.

21. Apparatus for selecting a chrominance portion of a pixel of an image of a video signal to be watermarked, said apparatus comprising a perception-based table in a computer readable medium that indicates for each of at least a plurality of possible pixels in at least a portion of a colorspace which, if any, of the chrominance portions would be least likely to introduce a visible artifact should watermark data be added thereto, said video signal to be watermarked without changing its luminance.

22. Apparatus for selecting a chrominance portion of a pixel of an image of a video signal to be watermarked so that there are effectively no changes to a luminance of said video signal, said apparatus comprising:

a computer readable store containing a perception-based table that is independent of said image and which indicates for each of at least a plurality of possible pixels in at least a portion of a colorspace which, if any, of the chrominance portions should be selected for watermarking; and

means for accessing said store to determine which chrominance portion, if any, to select, when said pixel of said image to be watermarked is one of said pixels in said portion of said colorspace.

23. The invention as defined in claim 22 further comprising means for computing as a function of a least one value of said pixel of said image which, if any, of the chrominance portions should be selected for watermarking, said means for computing operating only when said pixel is not one of said pixels in said portion of said colorspace.

24. Apparatus for selecting a chrominance portion of a pixel of an image of a video signal, said video signal having been watermarked without changing its luminance, said apparatus comprising:

a computer readable store containing a perception-based table that is independent of said image and which indicates for each of at least a plurality of possible pixels in at least a portion of a colorspace which, if any, of the chrominance portions most likely had watermarking data added thereto; and

means for accessing said store to determine which chrominance portion, if any, to select, when said pixel is one of said pixels in said portion of said colorspace

25. Apparatus in a receiver for selecting a chrominance portion of a pixel of an image of a video signal that may have been watermarked in a transmitter, said video signal have been watermarked so as not to change its luminance, the apparatus comprising:

a computer readable store containing a perception-based table that is independent of said image and which indicates for each of at least a plurality of possible pixels in at least a portion of a colorspace which, if any, of the chrominance portions was most likely selected to be watermark; and

means for accessing said store to determine which chrominance portion, if any, to select, when said pixel of said image is within said portion of said colorspace.

26. A method comprising the step of:

selecting at most one chrominance portion of a pixel of an image of a video signal to be watermarked by adding thereto additional information, said selecting step employing a perception-based table that is independent of (i) said image and (ii) said additional information, said table indicating for each of at least a plurality of possible pixels in a colorspace which one, if any, of the chrominance portions of said plurality of pixels in said colorspace should be selected to have said additional information added thereto.

27. Apparatus for supplying an indication as to which chrominance portion of a pixel an image of a video signal, if any, is better suited to be altered so as to carry additional watermark information, said apparatus comprising a perception-based table in a computer readable media for at least a portion of the possible pixel colorspace, said table being independent of (i) said image and (ii) said additional watermark information, said table specifying for pixels that are within said portion of said colorspace the chrominance portion to be indicated by said apparatus.

28. A method for detecting a watermark signal comprising the step of:

selecting a chrominance portion of a pixel of an image of a video signal, said video signal having been watermarked with watermark information, said selecting step employing a perception-based table that is independent of (i) said image and (ii) said watermark information and which indicates for each of at least a plurality of possible pixels in a colorspace which, if any, of the chrominance portions most likely had watermark data added thereto.

29. Apparatus for selecting a chrominance portion of a pixel of an image of a video signal to be watermarked by adding thereto additional information, said apparatus comprising a perception-based table in a computer readable medium that is independent of (i) said image and (ii) said additional information and which indicates for each of at least a plurality of possible pixels in at least a portion of a colorspace which, if any, of the chrominance portions would be least likely to introduce a visible artifact should watermark data be added thereto.

30. A method for detecting a watermark signal comprising the step of:

selecting a chrominance portion of a pixel of an image of a video signal that had watermark data added thereto, said selecting step employing a perception-based table that is independent of (i) said image and (ii) said watermark data and which indicates for each of at least a plurality of possible pixels in a colorspace which, if any, of the chrominance portions most likely had watermark data added thereto.

31. A method comprising the step of:

selecting no more than one chrominance portion of a pixel of an image of a video signal to be watermarked, said selecting step employing a perception-based table that is independent of said image and indicates for each of at least a plurality of possible pixels in a colorspace which, if any, of the chrominance portions of said plurality of pixels in said colorspace should be selected for watermarking.

32. Apparatus for supplying an indication as to only one of which, if any, chrominance portion of a pixel an image of a video signal, is better suited to be altered so as to carry additional watermark information, said apparatus comprising a perception-based table in a computer readable media for at least a portion of the possible pixel colorspace, said table being independent of said image, said table specifying for pixels that are within said portion of said colorspace the particular no more than one chrominance portion to be indicated by said apparatus.

33. A method for detecting a watermark signal comprising the step of:

selecting no more than one of a chrominance portion of a pixel of an image of a video signal, said video signal having been watermarked, said selecting step employing a perception-based table that is independent of said image and which indicates for each of at least a plurality of possible pixels in a colorspace which, if any, of the chrominance portions most likely had watermark data added thereto.

34. Apparatus for selecting no more than one chrominance portion of a pixel of an image of a video signal to be watermarked, said apparatus comprising a perception-based table in a computer readable medium that indicates for each of at least a plurality of possible pixels in at least a portion of a colorspace which, if any, of the chrominance portions would be least likely to introduce a visible artifact should watermark data be added thereto.

Evidence Appendix

None

Related Proceedings Appendix

None